REMARKS

Applicant would like to thank the Examiner for the careful consideration given the present application. The application has been carefully reviewed in light of the Office action, and amended as necessary to more clearly and particularly describe the subject matter which applicant regards as the invention.

Applicant would also like to thank the Examiner and the Examiner's supervisor for taking the time to discuss the present application during a telephone interview on March 29, 2010 at 10:00am. It is noted that, during the interview, the Examiner indicated agreement with applicant's arguments presented herein. Specifically, the Examiner agreed that the amendments tendered to claims 1, 13, and 14 overcome the outstanding rejections.

Before addressing the outstanding Office action, applicant wishes to disavow and withdraw the previously presented arguments related to an inverse relationship between internal and external force. See, for example, Amendment "F", page 14, line 16 – page 15, line 1. This argument is believed to be in error insofar as the claims define a directly proportional relationship between internal and external forces.

Turning to the Office action, **Claims 1, 3, and 12 – 20** stand rejected under 35 U.S.C. 103(a) as being unpatentable over Alastair et al. (U.S. Patent No. 3,418,662) in view of McBean et al. (US 2004/0106881). The rejections are traversed for the following reasons.

Claim 1 calls for an external force control method, and recites steps of: measuring myoelectric potential that occurs in a living body portion of an animal;

setting a value of an external force applied to a body portion of the animal according to an external force function; measuring a motion variable (which is a resultant force caused by an internal force and an external force); setting a factor as a ratio of the external force to the resultant force of the internal force and external force; determining whether a deviation between the set factor and a target factor is greater than a reference value; and, if so, setting a new external force function such that the set value of the factor approaches the target value. It is also noted that the external force is defined as a force caused by motion of an actuator applied through the orthosis to a first living body portion of an animal, and the internal force is defined as "a force exerted on the orthosis by the first living body portion" (as amended).

The primary cited reference, Alastair, fails to teach or suggest several features of the method of claim 1. Appendix A, attached hereto, includes a detailed discussion of all of the shortcomings of Alastair with respect to claim 1. Generally, the Alastair patent is directed to a prosthetic or artificial hand that does not apply an external force to a living animal, and does not have an internal force exerted thereon by the living animal. Rather, the prosthetic hand acts of its own accord, neither exerting a force on a part of a living animal, nor receiving a force from a part of a living animal. Further, there is no disclosure in the Alastair reference, nor is it known in the art, to provide a prosthetic hand in a manner other than attached to a stub-end of an arm such that the hand could impart or receive a force with respect to a part of a living animal.

Absent consideration of internal and external forces, as defined by claim 1, the Alastair patent does not teach or suggest the following steps recited in claim 1 (each of which considers/utilizes the internal and external forces):

1. the motion variable measurement step;
2. the factor setting step;
3. the determination stop; and
4. the external force function setting step of setting a new external force function.

The secondary reference, McBean, fails to remedy all of the shortcomings of Alastair. Particularly, McBean discloses a control method for an orthotic device that determines an intended muscular force via surface EMG sensors, force sensors, position sensors, velocity sensors, or some combination thereof. Insofar as McBean includes a disclosure related to the use of force sensors for sensing an intended movement, McBean does not disclose that a force applied to the orthotic from the user is summed with an external force applied by the orthotic to the user (to measure a motion variable y), with the sum then being compared with the external force (to set a factor) to determine whether a new force function need be set.

Rather, the cursory discussion related to the use of force sensors in McBean is presented only as an alternative embodiment, and does not include specific discussion related to operation. In view of the limited disclosure related to force sensors in McBean, the force sensors can only be interpreted as operating in the same manner as the EMG sensors, wherein an internal force signal would be translated to an external applied force. Such a force translation is considered to be too simplistic to disclose that defined by claim 1. Specifically, the McBean disclosure does not teach or suggest the claimed steps of measuring of the motion variable (internal force plus external force), setting a factor using an external force and the motion variable as variables, determining whether a deviation between the set factor and a target factor exceeds a reference value, and, if so, setting a new

external force function so the set factor approaches the target factor.

Accordingly, McBean does not remedy the shortcomings of Alastair with respect to claim 1. Thus, the combined references fail to teach or suggest each and every feature of claim 1, and as such, do not render claim 1 obvious. Reconsideration and withdrawal of the rejection of claim 1 is requested. Further, claims 3, 12, 15, and 16 depend from claim 1 and are therefore also considered allowable over the art.

With reference to claims 13 and 14, a control system and a program associated with the method of claim 1 are defined, respectively. Claims 13 and 14 have been amended in a manner similar to that of claim 1. As such, claims 13 and 14 are considered allowable for the same reasons as those presented above in favor of the patentability of claim 1. Reconsideration and withdrawal of the rejections of claims 13 and 14 is requested. Further, each of claims 17 – 20 depend from one of claims 13 and 14, and are therefore all also considered allowable over the art.

Claims 2 and 5 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Alastair and McBean, in further view of Curcie et al. (U.S. Patent No. 6,660,042). The rejections are traversed for the following reasons.

Claims 2 and 5 depend from claim 1. Accordingly, to render claims 2 and 5 obvious, the combined references must teach or suggest all features of claim 1. In this regard, the shortcomings of Alastair and McBean with respect to claim 1 are discussed above. The Curcie patent, which is cited for teaching a method for distributing forelimb forces, in which each finger is assigned a coefficient or weight related to an external force in a training mode, fails to remedy the shortcomings of

Alastair and McBean.

As such, claims 2 and 5 include features that are not taught or suggested by the cited art, and are therefore not rendered obvious thereby. Reconsideration and withdrawal of the rejections of claims 2 and 5 is requested.

Claim 4 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Alastair and McBean, in further view of Haslam, II et al. (U.S. Patent No. 5,413,611). The rejection is traversed for the following reasons.

Claim 4 depends from claim 1. Accordingly, to render claim 4 obvious, the combined references must teach or suggest all features of claim 1. In this regard, the shortcomings of Alastair and McBean with respect to claim 1 are discussed above. The Haslam patent, which is cited for teaching a force control method in which the external force is controlled in such a way that the maximum measured force approaches the maximum target, fails to remedy the shortcomings of Alastair and McBean.

As such, claim 4 includes features that are not taught or suggested by the cited art, and is therefore not rendered obvious thereby. Reconsideration and withdrawal of the rejection of claim 4 is requested.

Claims 7 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Alastair and McBean as applied to claim 1, and in further view of Kawai et al. (US 2004/0107780). The rejections are traversed for the following reasons.

Claims 7 and 8 depend from claim 1. Accordingly, to render claims 7 and 8 obvious, the combined references must teach or suggest all features of claim 1. In this regard, the shortcomings of Alastair and McBean with respect to claim 1 are discussed above. The Kawai application, which is cited for teaching an external

force control method in which primitive variables are measured and inputted to an inverse dynamics model along with motion state data in order to determine the motion state, fails to remedy the shortcomings of Alastair and McBean.

As such, claims 7 and 8 include features that are not taught or suggested by the cited art, and are therefore not rendered obvious thereby. Reconsideration and withdrawal of the rejections of claims 7 and 8 is requested.

Claims 9 – 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Alastair and McBean as applied to claim 1, and in further view of Davalli et al. (U.S. Patent No. 6,740,123). The rejections are traversed for the following reasons.

Claims 9 – 11 depend from claim 1. Accordingly, to render claims 9 – 11 obvious, the combined references must teach or suggest all features of claim 1. In this regard, the shortcomings of Alastair and McBean with respect to claim 1 are discussed above. The Davalli patent, which is cited for teaching four band factors each depending from the bend of the wrist and EMG activity feedback which results in different force controls, fails to remedy the shortcomings of Alastair and McBean.

As such, claims 9 – 11 include features that are not taught or suggested by the cited art, and are therefore not rendered obvious thereby. Reconsideration and withdrawal of the rejections of claims 9 – 11 is requested.

In light of the foregoing, it is respectfully submitted that the present application is in a condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in a condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present application.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 18-0160, our Order No. SAT-16887.

Respectfully submitted,

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APPENDIX A:
SHORTCOMINGS OF THE ALASTAIR PATENT

The primary cited reference, Alastair, fails to teach or suggest an external force control method having the following features of claim 1.

"controlling an external force applied to a first living body portion of an animal through an orthosis"

Alastair discloses an artificial prosthetic hand that can only be reasonably interpreted as being attached to a stub-end of a human arm. There is no disclosure in the Alastair reference, nor is it known in the art, to provide a prosthetic hand in any other manner. In view of this, the prosthetic hand of Alastair does not apply an external force to a living body portion of an animal. Rather, the hand acts of its own accord, exerting a force on no part of the living animal wearing the hand. It is also noted that Alastair does not disclose an orthosis, as such is defined by claim 1. In the Office action, the Examiner appears to acknowledge these shortcomings of Alastair.

"an external force setting step of setting a value of an external force f applied to the first living body portion of the animal through the orthosis"

Inasmuch as the Alastair prosthesis moves based on sensed EMG signals, the Alastair prosthesis does not set a value of a force that is to be applied to a living body portion of an animal through the prosthesis. Rather, the prosthesis of Alastair acts alone, without applying a force to a first living body portion of the animal. As such, any force setting step disclosed in Alastair does not disclose the setting of a force to be "applied to the first living body portion of the animal through the orthosis", as required by claim 1.

"a motion variable measurement step of measuring a motion variable y varying with the motion of the animal under the condition of the external force applied through the orthosis"

Without further reference to the definition of the "motion variable" (see below), this step requires that a measurement be made of a variable that varies "with the motion of the animal". Alastair only discloses measuring the EMG signals, the prosthetic hand of Alastair moves only in response to sensed EMG signals, and no regard to "the motion of the animal under the condition of external force applied through the orthosis" is given. Thus, Alastair does not teach the measurement of a motion variable that varies with the motion of the animal, as hereby required.

"measuring the resultant force of an internal force, which is a force exerted on the orthosis by the first living body portion caused by activities of animal muscle fibers in at least the second living body portion of the animal, and an external force, caused by motion of the actuator and applied through the orthosis to the first living body portion of the animal, as the motion variable y"

As stated above, the Alastair patent is only concerned with the movement of the prosthetic hand. The prosthetic hand does not apply a force to a living body portion (an external force), nor does the living body portion apply a force to the prosthetic hand (an internal force). As Alastair does not disclose an external force and an internal force, as these forces are defined by claim 1, Alastair necessarily fails to disclose a step of measuring a resultant force, which is a sum of the external and internal forces, as is required.

"a factor setting step of setting a value of a factor γ according to a factor function γ(f, y) with the external force f and the motion variable y as variables on the basis of the set value of the external force f and the measured value of the motion variable y"

As discussed above, Alastair does not disclose measuring (or otherwise using) the "motion variable" or "external force" of claim 1. As such, Alastair also does not disclose setting a factor with the motion variable and external force as variables. Further, Alastair is silent as to setting any factor with respect to forces acting on or through the prosthetic hand.

"setting the ratio of the external force f to the resultant force of the internal force and the external force of the animal as the factor γ ($0 \leq \gamma < 1$)"

As discussed above, Alastair does not disclose an external force applied by an orthosis to a living animal and an internal force applied by the animal to the orthosis. As such, Alastair necessarily does not disclose setting a factor as a ratio of the external force to the internal and external force.

"a determination step of determining whether a deviation δ between the set value of the factor γ and target value γ_t thereof is less than a reference value ε"

As Alastair does not disclose the factor of claim 1, Alastair also does not disclose a target value of the factor or a comparison between the set value and the target value of the factor.

"an external force function setting step of setting a new external force function f(x) in such a way that the set value of the factor γ approaches the target value γ_t if the deviation δ is determined to be equal to or greater than the

reference value ε in the determination step"

As acknowledged by the Examiner, Alastair does not disclose the setting of a new external force function, as required by claim 1.